FG82 ①

FIG.1 A GENERAL NETWORK ARRANGEMENT

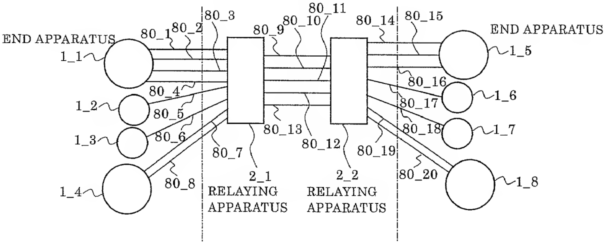

FIG.1 B SPECIFIC NETWORK ARRANGEMENT

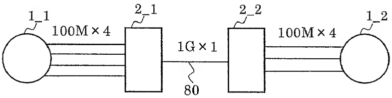

FIG.1 C LINK AGGREGATION & SUB-LOGICAL LINK

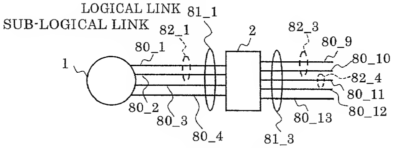

FIG.1 D OPERATION EXAMPLE OF SUB-LOGICAL LINKS

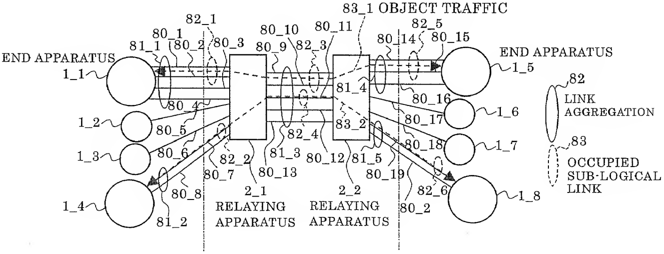

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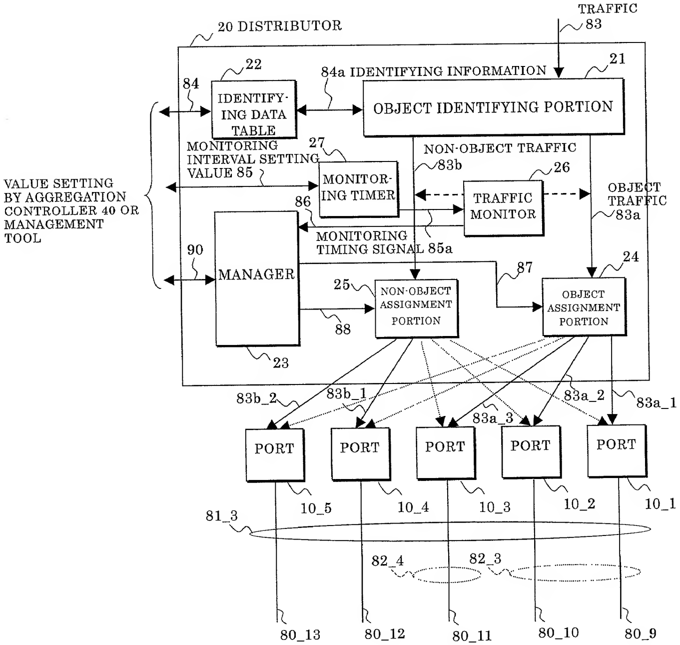
FIG.2


TRAFFIC
83
20 DISTRIBUTOR
22
21
84a IDENTIFYING INFORMATION
84
IDENTIFYING DATA TABLE
OBJECT IDENTIFYING PORTION
MONITORING INTERVAL SETTING VALUE 85
27
NON-OBJECT TRAFFIC
83b
26
MONITORING TIMER
TRAFFIC MONITOR
OBJECT TRAFFIC
83a
VALUE SETTING BY AGGREGATION CONTROLLER 40 OR MANAGEMENT TOOL
86
MONITORING TIMING SIGNAL 85a
90
24
87
MANAGER
25
NON-OBJECT ASSIGNMENT PORTION
OBJECT ASSIGNMENT PORTION
88
23
83b_2
83b_1
83a_2
83a_1
83a_3
PORT
PORT
PORT
PORT
PORT
10_5
10_4
10_3
10_2
10_1
81_3
82_4
82_3
80_13
80_12
80_11
80_10
80_9

## FIG.3A IDENTIFICATION BASED ON MAC ADDRESS

22

| KIND OF IDENTIFYING INFORMATION (IDENTIFYING CONDITION) | VALUE OF IDENTIFYING INFORMATION (CONDITION VALUE) |
|---|---|
| SOURCE MAC ADDRESS | 00:00:0e:14:32:22 |
| DESTINATION MAC ADDRESS | 00:e0:5f:53:22:21 |
| ⋮ | ⋮ |

## FIG.3B IDENTIFICATION USING INFORMATION OF IP/TCP HEADER

22

| KIND OF IDENTIFYING INFORMATION (IDENTIFYING CONDITION) | VALUE OF IDENTIFYING INFORMATION (CONDITION VALUE) |
|---|---|
| SOURCE IP ADDRESS | 133.10.15.3 |
| DESTINATION IP ADDRESS | 124.10.5.38 |
| DESTINATION PORT NO. | 69 |
| ⋮ | ⋮ |

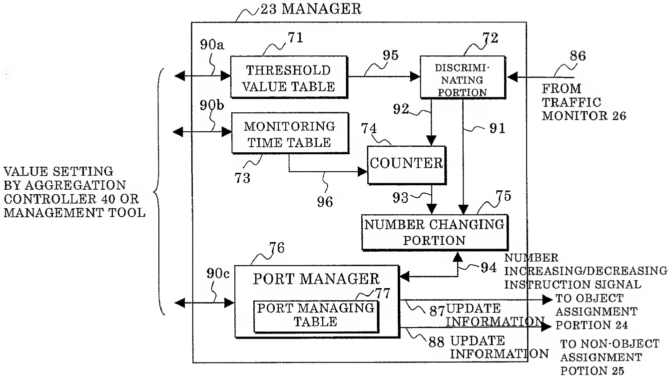
## FIG.3C IDENTIFICATION CORRESPONDING TO SUB-LOGICAL LINKS

22

| KIND OF IDENTIFYING INFORMATION (IDENTIFYING CONDITION) | VALUE OF IDENTIFYING INFORMATION (CONDITION VALUE) (SUB-LOGICAL LINK 82_3) | VALUE OF IDENTIFYING INFORMATION (CONDITION VALUE) (SUB-LOGICAL LINK 82_4) | ··· |
|---|---|---|---|
| SOURCE MAC ADDRESS | 00:00:0e:14:32:22 | — | ··· |
| DESTINATION MAC ADDRESS | 00:e0:5f:53:22:21 | — | ··· |
| SOURCE IP ADDRESS | — | 12.35.120.25 | ··· |
| DESTINATION IP ADDRESS | — | 122.131.11.221 | ··· |
| PORT NO. | — | 69 | ··· |
| ⋮ | ⋮ | ⋮ | ··· |

FG82 ④

# FIG.4


23 MANAGER
90a
71
THRESHOLD VALUE TABLE
95
72
DISCRIMI-NATING PORTION
86
FROM TRAFFIC MONITOR 26
90b
MONITORING TIME TABLE
73
92
74
COUNTER
91
96
93
75
NUMBER CHANGING PORTION
VALUE SETTING BY AGGREGATION CONTROLLER 40 OR MANAGEMENT TOOL
76
90c
PORT MANAGER
77
PORT MANAGING TABLE
94
NUMBER INCREASING/DECREASING INSTRUCTION SIGNAL
87 UPDATE INFORMATION
TO OBJECT ASSIGNMENT PORTION 24
88 UPDATE INFORMATION
TO NON-OBJECT ASSIGNMENT POTION 25

# FIG.5A

THRESHOLD VALUE TABLE 71

| OCCUPATION NUMBER | TRAFFIC AMOUNT | PORT AVAILABLE RATE FOR OBJECT TRAFFIC | PORT AVAILABLE RATE FOR NON-OBJECT TRAFFIC |
|---|---|---|---|
| 1 | 80Mbps | 80% | 80% |
| 2 | 160Mbps | | |
| 3 | 240Mbps | | |
| 4 | 320Mbps | | |
| ⋮ | ⋮ | | |

# FIG.5B

MONITORING TIME TABLE 73

| CORRESPONDING COUNTER | COUNT |
|---|---|
| RELEASING COUNTER | 50 TIMES |
| DECREASING COUNTER | 50 TIMES |

# FIG.5C

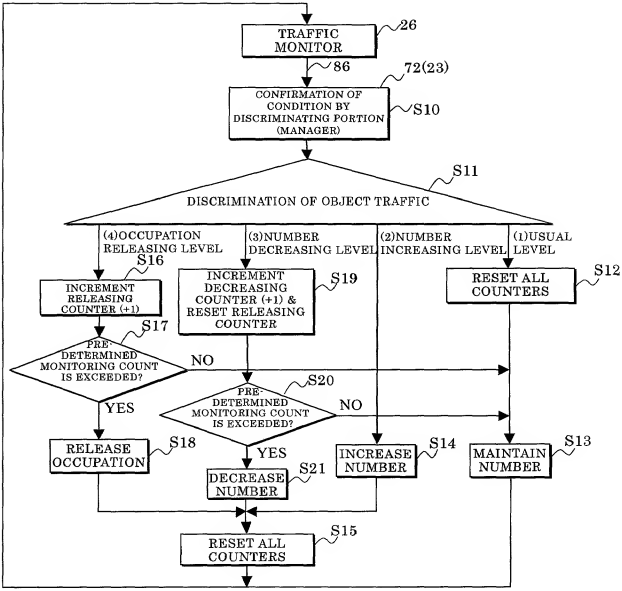
PORT MANAGING TABLE 77

| PORT | FOR OBJECT TRAFFIC |
|---|---|
| 10_1 | ○ |
| 10_2 | ○ |
| 10_3 | ○(□→○) |
| 10_4 | □ |
| 10_5 | □ |

○: OCCUPIED PORT (PORT FOR OBJECT TRAFFIC)

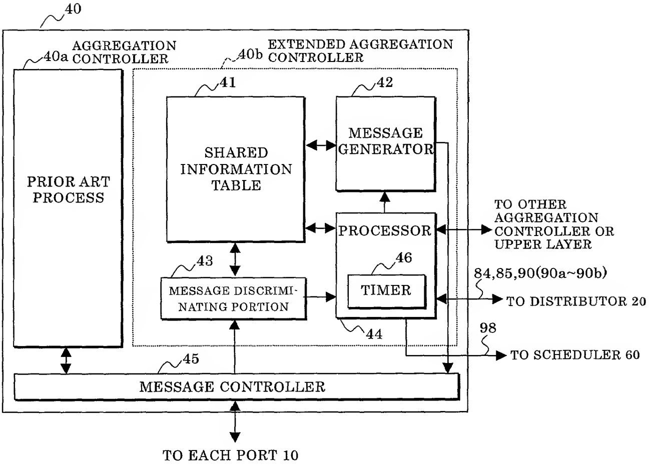
□: NON-OCCUPIED PORT (PORT FOR NON-OBJECT TRAFFIC)

## FIG.6


TRAFFIC MONITOR
26
86
72(23)
CONFIRMATION OF CONDITION BY DISCRIMINATING PORTION (MANAGER)
S10
S11
DISCRIMINATION OF OBJECT TRAFFIC
(4)OCCUPATION RELEASING LEVEL
(3)NUMBER DECREASING LEVEL
(2)NUMBER INCREASING LEVEL
(1)USUAL LEVEL
S16
INCREMENT RELEASING COUNTER (+1)
INCREMENT DECREASING COUNTER (+1) & RESET RELEASING COUNTER
S19
RESET ALL COUNTERS
S12
S17
PRE-DETERMINED MONITORING COUNT IS EXCEEDED?
NO
S20
PRE-DETERMINED MONITORING COUNT IS EXCEEDED?
NO
YES
RELEASE OCCUPATION
S18
YES
DECREASE NUMBER
S21
INCREASE NUMBER
S14
MAINTAIN NUMBER
S13
RESET ALL COUNTERS
S15

FG82 ⑦

FIG.7


40
40a AGGREGATION CONTROLLER
40b EXTENDED AGGREGATION CONTROLLER
PRIOR ART PROCESS
41
SHARED INFORMATION TABLE
42
MESSAGE GENERATOR
PROCESSOR
46
TIMER
44
43
MESSAGE DISCRIMI-NATING PORTION
45
MESSAGE CONTROLLER
TO OTHER AGGREGATION CONTROLLER OR UPPER LAYER
84,85,90(90a~90b)
TO DISTRIBUTOR 20
98
TO SCHEDULER 60
TO EACH PORT 10

FG82 (8)

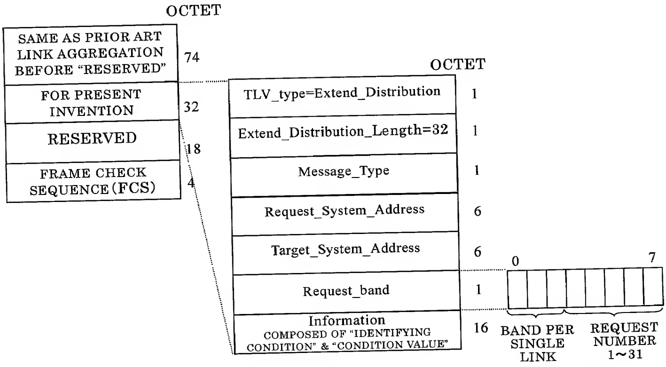
# FIG.8

41

| | SUB-LOGICAL LINK 82_3 | SUB-LOGICAL LINK 82_4 | ··· |
|---|---|---|---|
| OCCUPATION FLAG | on | on | ··· |
| REQUEST NUMBER | 2 | 1 | ··· |
| REQUEST BAND PER SINGLE LINK | 100(Mbps) | 100(Mbps) | ··· |
| REQUEST SOURCE ADDRESS | 00:00:0e:14:32:22 | 00:00:0e:14:32:29 | ··· |
| DESTINATION ADDRESS | 00:e0:5f:53:22:21 | 00:e0:5f:53:22:26 | ··· |
| IDENTIFYING CONDITION 1 | SOURCE MAC ADDRESS | SOURCE IP ADDRESS | ··· |
| CONDITION VALUE 1 | 00:00:0e:14:32:22 | 12.35.120.25 | ··· |
| IDENTIFYING CONDITION 2 | DESTINATION MAC ADDRESS | DESTINATION IP ADDRESS | ··· |
| CONDITION VALUE 2 | 00:e0:5f:53:22:21 | 122.131.11.221 | ··· |
| IDENTIFYING CONDITION 3 | NONE | DESTINATION PORT NO. | ··· |
| CONDITION VALUE 3 | – | 69 | ··· |
| IDENTIFYING CONDITION 4 | – | NONE | ··· |
| CONDITION VALUE 4 | – | – | ··· |
| ⋮ | ⋮ | ⋮ | ··· |

FG82 ⑨

# FIG.9

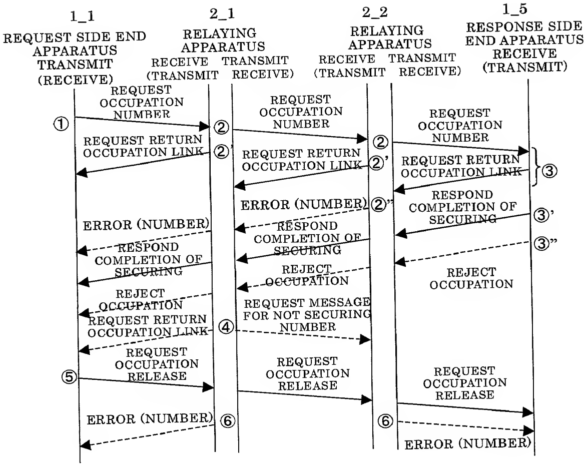


Message_Type
- 01: REQUEST
- 02: RESPONSE
- 03: REJECTION
- 04: ERROR (NUMBER)
- 05: ERROR (OCCUPIED)
- 06: REQUEST FROM RELAYING APPARATUS
- 07: RELEASE REQUEST
- 8X: MESSAGE IN A SINGLE LINK (X:1~7)

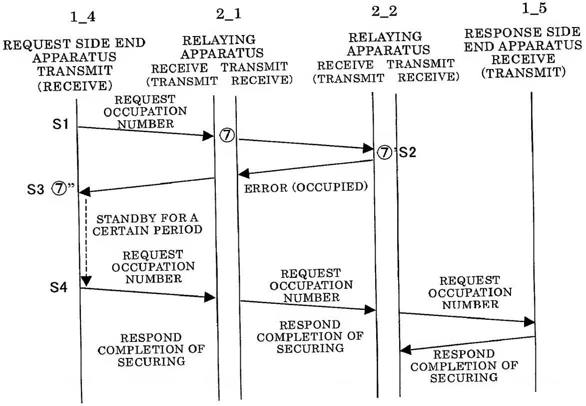
001:10Mbps
010:100Mbps
011:1Gbps
100:10Gbps

FG82 (10)

## FIG.10A USUAL SEQUENCE

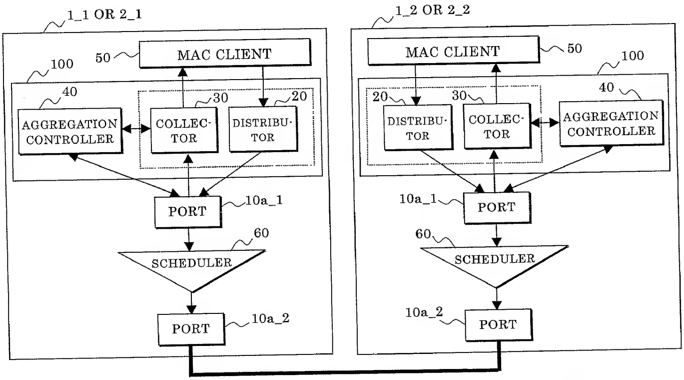


## FIG.10B SEQUENCE UPON REQUEST OVERLAPPED



FG82 (11)

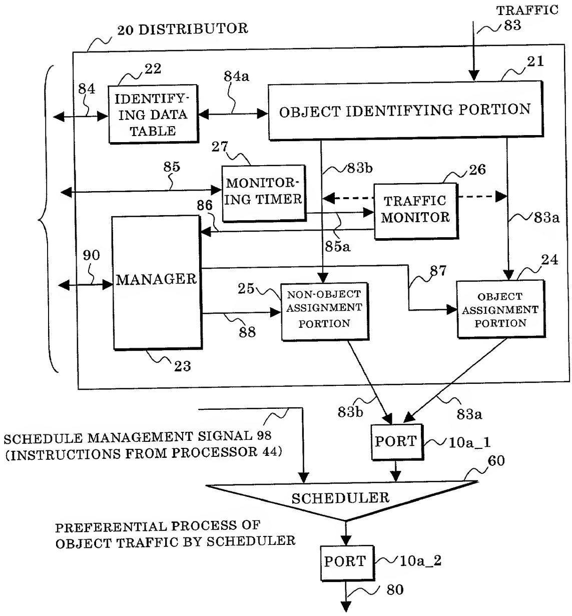
FIG.11



PREFERENTIAL PROCESS OF OBJECT TRAFFIC BY SCHEDULER

FG82 (12)

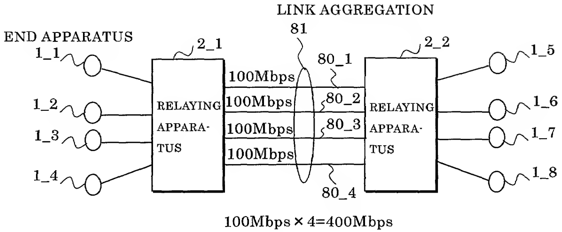
FIG.12



# PRIOR ART

## FIG.13A

OUTLINE OF LINK AGGREGATION



## FIG.13B

OUTLINE OF LINK AGGREGATION PORT FUNCTION

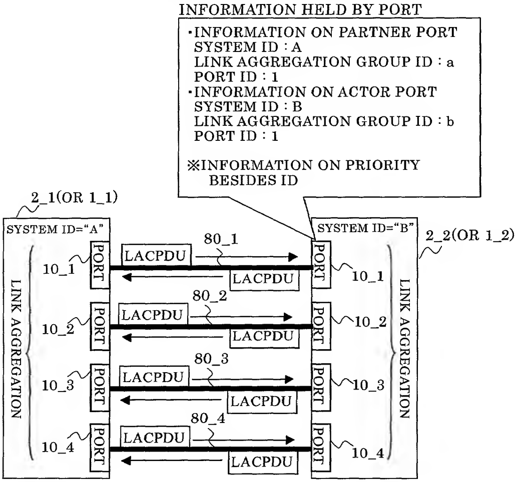


FIG.14A

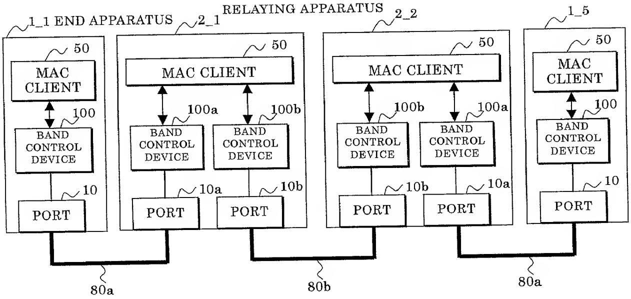
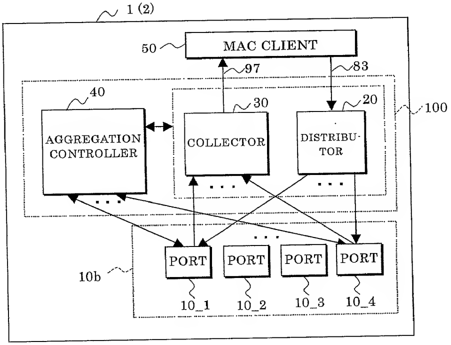
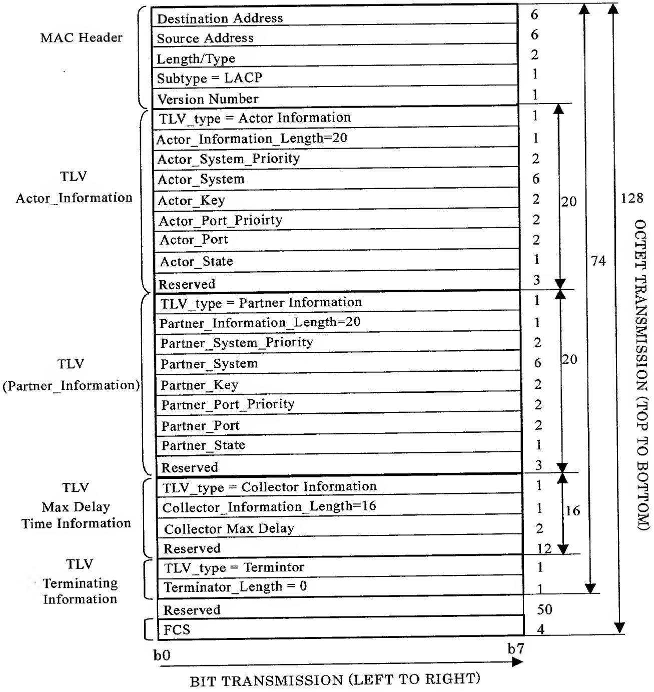


FIG.14B



FG82 (15) 止

# FIG.15



| | Field | Octets |
|---|---|---|
| MAC Header | Destination Address | 6 |
| | Source Address | 6 |
| | Length/Type | 2 |
| | Subtype = LACP | 1 |
| | Version Number | 1 |
| TLV Actor_Information | TLV_type = Actor Information | 1 |
| | Actor_Information_Length=20 | 1 |
| | Actor_System_Priority | 2 |
| | Actor_System | 6 |
| | Actor_Key | 2 |
| | Actor_Port_Prioirty | 2 |
| | Actor_Port | 2 |
| | Actor_State | 1 |
| | Reserved | 3 |
| TLV (Partner_Information) | TLV_type = Partner Information | 1 |
| | Partner_Information_Length=20 | 1 |
| | Partner_System_Priority | 2 |
| | Partner_System | 6 |
| | Partner_Key | 2 |
| | Partner_Port_Priority | 2 |
| | Partner_Port | 2 |
| | Partner_State | 1 |
| | Reserved | 3 |
| TLV Max Delay Time Information | TLV_type = Collector Information | 1 |
| | Collector_Information_Length=16 | 1 |
| | Collector Max Delay | 2 |
| | Reserved | 12 |
| TLV Terminating Information | TLV_type = Termintor | 1 |
| | Terminator_Length = 0 | 1 |
| | Reserved | 50 |
| | FCS | 4 |